PS1 QFT3 (Due date - March 12th 2015)

PS1

1. Show that if one explicitly would introduce $M^2 A_\mu A^\mu$ mass term to
$$\mathcal{L} = -\frac{1}{4} F_{\mu\nu} F^{\mu\nu} + \bar{\Psi}(i\gamma^\mu(\partial_\mu + ieA_\mu) - m)\Psi$$
(abelian case), than $\delta\mathcal{L} = -\frac{2M^2}{e} A^\mu(x)\,\partial_\mu \omega(x)$ for infinitesimally small gauge transformation
$$\delta A^\mu = -\frac{1}{e}\partial_\mu \omega(x)$$
etc...

[2]

2. Show that for non-abelian gage trasformation for infinitesimal $\omega^a = \omega^a(x)$ the variation of $A^a_\mu(x)$ should take a form
$$\delta A^a_\mu(x) = \varepsilon_{abc} A^b_\mu(x)\,\omega^c(x) - \frac{1}{g}\partial_\mu \omega(x)$$
to provide a gauge symmetry to
$$\mathcal{L} = \bar{\Psi}(i\gamma^\mu(\partial_\mu + igT^a A^a_\mu) - m)\Psi$$

[4]

3. Derive Feynman rule for triple non-abelian gauge boson interaction using path integral formalism

[14]